

LISTING OF THE CLAIMS

The listing of claims set forth below will replace all prior versions and listings of claims in the application.

1. (Currently amended) A barrier operator for moving a barrier between open and closed positions with respect to a barrier opening, the barrier operator comprising:

a light pattern generator to project an optical light pattern onto a floor across the barrier opening, the light pattern being a single uninterrupted substantially straight line of light in the absence of an obstruction and being projected during at least a closing movement of the barrier;

[[an]] a single imaging device configured to observe the floor across the barrier opening and to acquire an image of the line of light and detect a change in grey level in the imaging device, which change is representative of an interruption in the line of light on the floor projected by the light pattern generator; and

a controller coupled to the imaging device to sense when there is a change in the grey level in the imaging device ~~the observed single uninterrupted substantially straight line of light in the observed portion of the barrier opening changes from a single substantially straight line, and configured to generate~~ generating a detection signal in response thereto, the detection signal being indicative of the presence of the obstruction at least during the closing movement of the barrier and which detection signal ~~effects~~ is configured to effect at least a stopping or reversal of the closing movement of the barrier.

2. (Currently Amended) The barrier operator of claim 1, wherein the imaging device ~~is a single device which is configured to detect the change in grey level along the line of light without regard to imaging a two dimensional area acquire an image of the line and detect an interruption of the line of light.~~

3-4. (Cancelled)

5. (Previously Presented) The barrier operator of claim 1, wherein the light pattern generator is configured to be mounted above and at an angle to the barrier opening.

6. (Previously Presented) The barrier operator of claim 1, comprising an alarm device configured to generate an alarm indication in response to the detection signal.

7. (Original) The barrier operator of claim 6, wherein the alarm indication is an audible signal.

8. (Original) The barrier operator of claim 6 wherein the alarm indication is a visual signal.

9. (Original) The barrier operator of claim 1, comprising a barrier drive unit for moving the barrier, and wherein the controller is responsive to the detection signal to control the barrier drive.

10. (Original) The barrier operator of claim 1, wherein the light pattern generator comprises:

a source of electrical energy;

a laser diode; and

an optical lens to focus a beam generated by the laser diode.

11. (Original) The barrier operator of claim 1, wherein the imaging device is a CCD camera.

12. (Original) The barrier of claim 1, wherein the light pattern generator is disposed on the barrier.

13. (Original) The barrier operator of claim 1, comprising a head unit with a motor for moving the barrier, and the imaging device is disposed on the head unit.

14-17. (Cancelled)

18. (Currently amended) A method of detecting an object in a barrier opening for a barrier which moves between open and closed positions, the method comprising:
projecting from above a floor at the barrier opening and at an angle offset from a vertical plane formed by the barrier when it closes the opening a substantially linear line of light onto the floor in the barrier opening and producing a substantially linear line of light on the floor during at least a closing movement of the barrier, the substantially linear line of light on the floor being a single uninterrupted substantially straight line in the absence of an obstruction;
observing with a digital imaging device the optical pattern at an off-set angle to the linear line of light on the floor and to the vertical plane formed by the barrier when closed in the barrier opening to detect a grey level for the optical pattern;
detecting with the digital imaging device whether there has been a change in the grey level in the digital imaging device ~~an interruption of the substantially linear line of light on the floor;~~
producing a control signal at least during the closing movement of the barrier ~~as a result of in response to a change in grey level sensed by the digital imaging device the obstruction interrupting the uninterrupted substantially linear line of light in the barrier opening of the barrier, the change in grey level evidencing an obstruction which has interrupted the line of light in the barrier opening~~ and which change in grey level detection ~~detection~~ effects at least a stopping or reversal of the closing movement of the barrier.

19. (Original) The method of claim 18, comprising generating an alarm signal responsive to the control signal.

20. (Previously Presented) The method of claim 18, wherein the digital imaging device is at an angle offset from the vertical plane formed by the barrier when it closes the opening.

21. (Currently amended) A barrier operator for moving a barrier along a barrier path between open and closed positions in a barrier opening, the barrier operator comprising:

a light pattern generator configured to be above a floor in the opening and at an angle offset from a vertical plane formed by the barrier when it closes the barrier opening, wherein the light pattern generator is configured to project a single substantially straight line of uninterrupted light onto the floor in the absence of an obstruction ~~an optical beam across the barrier path during at least a closing movement of the barrier to produce a projected single substantially straight line of uninterrupted light onto the floor in the absence of an obstruction;~~

[[an]] a single imaging device configured to observe the floor in the barrier path and acquire an image of the line of light [[as]] illuminated by the light generator ~~optical beam~~ and to sense a change in grey level which evidences an interruption of the line of light by an obstruction in the line projected by the light pattern generator; and

a controller coupled to the imaging device, the controller configured to respond to the sensed change in grey level ~~interruption~~ in the acquired image of the line of light [[by]] because of the [[an]] obstruction at least during the closing movement of the barrier and which response effects at least a stopping movement of the barrier without regard to imaging a two dimensional area by the imaging device ~~consulting a data structure stored in memory.~~

22-25. (Cancelled)

26. (Currently Amended) A method of detecting an object in a barrier opening having a barrier controlled by an operator which moves the barrier between open and closed positions, the method comprising:

projecting a substantially linear line of light onto a floor in the barrier opening from above the floor and at an angle offset from a vertical plane formed by the barrier when it closes

the barrier opening, and the projected line of light producing an uninterrupted substantially linear line of light on the floor in the absence of an obstruction during at least a closing movement of the barrier;

observing ~~with a digital imaging device~~ the substantially linear line of light on the floor with a single digital imaging device;

sensing with the digital imaging device whether there has been a change of grey level of a pixel point in the line of light being sensed by the imaging device because of an interruption of the substantially linear line of light on the floor; and

producing a control signal in response to a sensed change of grey level of the pixel point ~~interruption of the substantially linear line on the floor in the barrier opening~~ at least during the closing movement of the barrier and which detection effects at least a stopping or reversal of the closing movement of the barrier without regard to imaging a two dimensional area ~~consulting data stored in a memory of the operator.~~

27. (Previously Presented) The method of claim 26, wherein the digital imaging device is at an angle offset from the vertical plane formed by the barrier when it closes the opening.

28. (New) The method of claim 18, wherein the imaging device is a single device which is configured to detect a change in grey level along the line of light without regard to imaging a two dimensional area.